

SECTION 16415

ELECTRICAL WORK, INTERIOR

1 GENERAL

1.1 SUMMARY (NOT APPLICABLE)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C82.4 (1985; C82.4a-1988) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple Supply Type)

FEDERAL SPECIFICATIONS (FS)

FS L-C-530 (Rev C) Coating, Pipe, Thermoplastic Resin

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 142 (1982) Recommended Practice for Grounding of Industrial and Commercial Power Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 (1985; Rev 1 & 2, ICS 6) Enclosures for Electrical Equipment (1000 Volts Maximum)

NEMA AB 1 (1986; Rev 1) Molded Case Circuit Breakers and Molded Case Switches

NEMA AB 3 (1984) Molded Case Circuit Breakers and Their Application

NEMA ICS 6 (1988) Enclosures for Industrial Control and Systems

NEMA LE 4 (1987) Recessed Luminaires, Ceiling Compatibility

NEMA OS 1 (1984) Sheet Steel Outlet Boxes, Device Boxes, Covers and Box Supports

NEMA PB 1 (1984; PB 2.1-1986) Panelboards

NEMA RN 1 (1986) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

NEMA WD 1 (1983) General Requirements for Wiring Devices

NEMA WD 6 (1988) Wiring Devices - Dimensional Requirements

NATIONAL FIRE PROTECTION ASSN (NFPA)

NFPA 70 (1993) National Electrical Code

NFPA 101 (1988) Safety to Life from Fire in Buildings and Structures

UNDERWRITERS LABORATORIES, INC (UL)

UL 5 (May 28, 1985; 10th Ed) Surface Metal Raceways and Fittings

UL 6 (Oct 23, 1981; 9th Ed; Rev thru November 22, 1989) Rigid Metal Conduit

UL 20 (Jun 12, 1986; 10th Ed; Errata; Rev thru Sep 23, 1988) General-Use Snap Switches

UL 44 (Aug 29, 1983; 12th Ed; Rev thru Jan 29, 1990) Rubber-Insulated Wires and Cables

UL 50 (Sep 8, 1988; 9th Ed; Rev May 18, 1989) Cabinets and Boxes

UL 67 (Oct 12, 1988, 10th Ed; Rev thru Nov 14, 1989) Panelboards

UL 83 (Sep 26, 1983; 9th Ed; Rev thru Feb 22, 1989) Thermoplastic-Insulated Wires and Cables

UL 98 (Jan 13, 1987; 11th Ed; Rev thru Feb 3, 1988) Enclosed and Dead-Front Switches

UL 467 (Nov 22, 1984; 6th Ed; Rev thru Nov 14, 1986) Grounding and Bonding Equipment

UL 486A (Nov 24, 1980; 7th Ed; Rev thru Oct 12, 1989) Wire Connectors and Soldering Lugs for Use with Copper Conductors

UL 486C (Dec 30, 1983; 1st Ed; Rev thru Oct 12, 1989) Splicing Wire Connectors

UL 489	(Sep 15, 1986; 7th Ed; Rev thru Apr 13, 1988) Molded-Case Circuit Breakers and Circuit-Breaker Enclosures
UL 498	(Nov 3, 1986; 11th Ed; Rev thru Mar 14, 1989) Attachment Plugs and Receptacles
UL 510	(Oct 6, 1986; 6th Ed, Rev Oct 7, 1986) Insulating Tape
UL 514A	(Dec 1, 1983; 7th Ed; Rev thru Jan 22, 1990, Errata, Feb 15, 1990) Metallic Outlet Boxes
UL 514B	(Mar 15, 1989; 2nd Ed Rev Oct 30, 1989) Fittings for Conduit and Outlet Boxes
UL 698	(Jul 6, 1984; 10th Ed; Rev thru Jun 28, 1989) Industrial Control Equipment for Use in Hazardous (Classified) Locations
UL 797 Metallic Tubing	(Oct 10, 1983; 5th Ed) Electrical
UL 844	(Nov 29, 1984; 9th Ed; Rev thru Jan 16, 1989) Electric Lighting Fixtures for Use in Hazardous (Classified) Locations
UL 869A 1989) Service Equipment	(Mar 23, 1987; 1st Ed; Rev thru Mar 1,
UL 877	(Aug 15, 1985; 3rd Ed; Rev thru Mar 23, 1987) Circuit Breakers and Circuit-Breaker Enclosures for Use in Hazardous (Classified) Locations
UL 886	(Jun 12, 1985; 9th Ed; Rev thru Dec 22, 1988) Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations
UL 943	(Sep 11, 1985; 2nd Ed) Ground-Fault Circuit Interrupters
UL 1010	(Feb 24, 1986; 4th Ed; Rev thru Sep 6, 1988) Receptical-Plug Combinations for Use in Hazardous (Classified) Locations
UL 1029	(Dec 1, 1986; 4th Ed; Rev thru Apr 29, 1989) High-Intensity-Discharge Lamp Ballasts
UL 1242 Intermediate Metal Conduit	(Oct 10, 1983; 1st Ed; Rev Nov 23, 1989)

UL 1571 (Feb 7, 1984; 2nd Ed; Rev thru Jul 27, 1989)
Incandescent Lighting Fixtures

UL 1572 (Dec 10, 1984; 2nd Ed; Rev thru Mar 31, 1989)
High Intensity Discharge Lighting Fixtures

1.3 GENERAL

1.3.1 Rules

The installation shall conform to the requirements of NFPA 70 and NFPA 101, unless more stringent requirements are indicated herein or shown.

1.3.2 Coordination

The drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor will become familiar with all details of the work and verify all dimensions in the field so that the outlets and equipment shall be properly located and readily accessible. Lighting fixtures, outlets, and other equipment and materials shall be located to avoid interference with mechanical or structural features; otherwise, lighting fixtures shall be symmetrically located according to the room arrangement when uniform illumination is required, or asymmetrically located to suit conditions fixed by design and shown. Raceways, junction and outlet boxes, and lighting fixtures shall not be supported from sheet metal roof decks. If any conflicts occur necessitating departures from the drawings, details of and reasons for departures shall be submitted and approved prior to implementing any change. The Electrical Contractor shall coordinate the electrical work with other disciplines and electrical drawings and provide all power related wiring even if they are not shown on electrical drawings.

1.3.3 Hazardous Locations

Wiring in locations indicated shall conform to the NFPA 70 for Class I, II Divisions 1 and 2 hazardous locations. Equipment shall be suitable for Groups C and D.

1.3.4 Standard Products

Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.3.5 Identification Nameplates

Major items of electrical equipment and major components shall be permanently marked with an identification name to identify the equipment by type or function and specific unit number as indicated. Unless otherwise specified, all identification nameplates shall be made of laminated plastic with black outer layers and a white core. Edges shall be chamfered. Plates shall be fastened with black-finished round-head drive screws or

approved nonadhesive metal fasteners. When the nameplate is to be installed on an irregular-shaped object, the Contractor shall devise an approved support suitable for the application and ensure the proper installation of the supports and nameplates. In all instances, the nameplate shall be installed in a conspicuous location. At the option of the Contractor, the equipment manufacturer's standard embossed nameplate material with black paint-filled letters may be furnished in lieu of laminated plastic. The following equipment, as a minimum, shall be provided with identification nameplates:

Minimum 1/4-Inch High
Letters

Panelboards
Safety Switches
Equipment Enclosures

Each panel, or similar assemblies shall be provided with a nameplate in addition to nameplates listed above, which shall be provided for individual compartments in the respective assembly, including nameplates which identify "future," "spare," and "dedicated" or "equipped spaces."

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTALS:

SD-04 Drawings

Electrical Work; GA.

Detail drawings consisting of a complete list of equipment and materials, including manufacturer's descriptive and technical data, catalog cuts, special installation instructions, applicable schematic diagrams, [and] equipment layout and anchorage, and conduit runs, anchorage, and support. Two sets of as-built drawings, within 30 days following the project completion or turnover.

SD-09 Reports

Materials and Equipment; GA.

The label or listing of the Underwriters Laboratories Inc., as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing, a statement may be submitted from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements. However, materials and equipment installed in hazardous locations must bear the UL label unless the data submitted from other testing agency is specifically approved in writing by the Contracting Officer.

1.5 WORKMANSHIP

Materials and equipment shall be installed in accordance with recommendations of the manufacturer and as shown.

2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall conform to the respective publications and other requirements specified below. Materials and equipment not listed below shall be as specified elsewhere in this section.

2.1.1 Cables and Wires

Conductors in cables shall be annealed copper. Design is based on copper conductors. Cables shall be single-conductor type, unless otherwise indicated. Cables and wires shall conform to [UL 44](#) for rubber-insulated type; [UL 83](#) for the thermoplastic-insulated type.

2.1.1.1 Nonmetallic Sheathed Cables

Type NM or NMC, with ground conductor.

2.1.1.2 Service Entrance Cable

Type USE.

2.1.1.3 Grounding Cables

Grounding cables shall be bare or shall have green low-voltage insulation.

2.1.2 Circuit Breakers

Circuit breakers shall have voltage, current and interrupting ratings as indicated. Fully rated circuit breakers shall be provided to obtain the specified interrupting rating. Fully rated circuit breakers shall be provided as indicated, for specific distribution equipment, to obtain the specified interrupting rating.

2.1.2.1 Molded-Case [and Insulated-Case Circuit Breakers]

[NEMA AB 1](#), [NEMA AB 3](#), and [UL 489](#) for circuit breakers, and [UL 877](#) for circuit breakers and circuit breaker enclosures in hazardous (classified) locations.

- a. Molded-Case Circuit Breakers: Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multipole breakers shall be of the common-trip type having a single operating handle, but for sizes of 100 amperes or less may consist of single-pole breakers permanently factory assembled into a multipole unit having an internal, mechanical, nontamperable common-trip mechanism and external handle ties. Breakers

coordinated with current-limiting fuses shall have a combined interrupting capacity of 100,000 symmetrical amperes. All poles of associated breakers shall open if any fuse blows.

- b. Insulated-Case, Systems-Type Circuit Breakers: Breakers shall have continuous, short time withstand, and interrupting current ratings and frame sizes as indicated.

2.1.2.2 Ground Fault Circuit Interrupters

UL 943. Breakers equipped with ground fault interrupters shall have ground fault class, interrupting capacity, and voltage and current ratings as indicated.

2.1.3 Conduit and Tubing

2.1.3.1 Electrical, Zinc-Coated Steel Metallic Tubing (EMT)

UL 797.

2.1.3.2 Intermediate Metal Conduit

UL 1242.

2.1.3.3 PVC Coated Rigid Steel Conduit

NEMA RN 1.

2.1.3.4 Rigid Metal Conduit

UL 6.

2.1.3.5 Surface Metal Electrical Raceways and Fittings

UL 5.

2.1.4 Conduit and Device Boxes and Fittings

2.1.4.1 Boxes, Metallic Outlet

NEMA OS 1 and UL 514A.

2.1.4.2 Boxes, Outlet for Use in Hazardous (Classified) Locations

UL 886.

2.1.4.3 Boxes, Switch (Enclosed), Surface-Mounted

UL 98.

2.1.4.4 Fittings for Conduit and Outlet Boxes

UL 514B.

2.1.4.5 Fittings for Use in Hazardous (Classified) Locations

UL 886.

2.1.5 Conduit Coatings Plastic Resin System

FS L-C-530 or NEMA RN 1, Type A-40.

2.1.6 Connectors, Wire Pressure

2.1.6.1 Copper Conductors

UL 486A.

2.1.7 Electrical Grounding and Bonding Equipment

UL 467.

2.1.7.1 Ground Rods

Ground rods shall be of copper-clad steel conforming to UL 467 3/4 inch in diameter by 10 feet in length of the sectional type driven full length into the earth.

2.1.8 Enclosures

NEMA ICS 6 or NEMA 250 or UL 698 for use in hazardous (classified) locations, unless otherwise specified.

2.1.8.1 Cabinets and Boxes

UL 50.

2.1.8.2 Circuit Breaker

UL 489.

2.1.8.3 Circuit Breaker for Use in Hazardous (Classified) Locations

UL 877.

2.1.9 Fixtures, Lighting and Fixture Accessories/Components

Standard Drawing 40-06-04 sheets referenced hereinafter and enclosed as an integral part of these specifications, additional fixtures shown on contract drawings, and UL 844 for fixtures to be installed in hazardous classified locations. Fixtures, accessories and components, including ballasts, lampholders, lamps, starters and starter holders, shall conform to industry standards specified below.

2.1.9.1 Incandescent Fixture

NEMA LE 4 for ceiling compatibility of recessed fixtures and UL 1571.

2.1.9.2 High-Intensity-Discharge

- a. Fixture: NEMA LE 4 for ceiling compatibility of recessed fixtures and UL 1572.
- b. Ballasts: ANSI C82.4 for multiple supply types and UL 1029.

2.1.10 Panelboards

Dead-front construction, NEMA PB 1 and UL 67.

2.1.11 Receptacles

2.1.11.1 General Grade

NEMA WD 1.

2.1.11.2 Standard Grade

UL 498.

2.1.11.3 Ground Fault Interrupters

UL 943, Class A or B.

2.1.11.4 Hazardous Classified Locations

UL 1010.

2.1.12 Service Equipment

UL 869A.

2.1.13 Splice, Conductor

UL 486C.

2.1.14 Snap Switches

UL 20.

2.1.15 Tapes

2.1.15.1 Plastic Tape

UL 510.

2.1.15.2 Rubber Tape

UL 510.

2.1.16 Wiring Devices

NEMA WD 1 for general-purpose wiring devices, and NEMA WD 6 for dimensional requirements of wiring devices.

3 EXECUTION

3.1 GROUNDING

Grounding shall be in conformance with NFPA 70, the contract drawings, and the following specifications.

3.1.1 Ground Rods

The maximum resistance measured in accordance with IEEE Std 142 of a driven ground shall not exceed 25 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, 2 additional rods not less than 6 feet on centers, or if sectional type rods are used, 2 additional sections may be coupled and driven with the first rod. In high-ground-resistance, UL listed chemically charged ground rods may be used. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, the Contracting Officer shall be notified immediately. Connections below grade shall be fusion welded. Connections above grade shall be fusion welded or shall use UL 467 approved connectors.

3.1.2 Ground Wire

A green ground wire shall be furnished regardless of the type of conduit.

3.2 WIRING METHODS

3.2.1 General Requirements

Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid zinc-coated steel conduit, electrical metallic and/ or intermediate metal conduit.

3.2.2 Conduit and Tubing Systems

Conduit and tubing systems shall be installed as indicated. Conduit sizes shown are based on use of copper conductors with insulation types as described in paragraph WIRING METHODS. Minimum size of raceways shall be 1/2 inch. Only metal conduits will be permitted when conduits are required for shielding or other special purposes indicated, or when required by conformance to NFPA 70. Penetrations of above grade floor slabs, time-rated partitions and fire walls shall be firestopped. Raceways shall not be installed under the firepits of boilers and furnaces and shall be kept 6 inches away from parallel runs of flues, steam pipes and hot-water pipes. Raceways shall be concealed within finished walls, ceilings, and floors unless otherwise shown. Raceways crossing structural expansion joints shall be provided with suitable expansion fittings or other suitable means to compensate for the building expansion and contraction and to provide for continuity of grounding.

3.2.2.1 Below Slab-on-Grade or in the Ground

All electrical wiring below slab-on-grade shall be protected by a conduit system. Conduit passing vertically through slabs-on-grade shall be rigid steel. Rigid steel conduits installed below slab-on-grade or in the earth shall be field-wrapped with 0.010-inch thick pipe-wrapping plastic tape applied with a 50-percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system.

3.2.2.2 Exposed Raceways

Exposed raceways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings.

3.2.2.3 Changes in Direction of Runs

Changes in direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Care shall be taken to prevent the lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment during the course of construction. Clogged raceways shall be entirely freed of obstructions or shall be replaced.

3.2.2.4 Supports

Metallic conduits and tubing shall be securely and rigidly fastened in place at intervals of not more than 10 feet and within 3 feet of boxes, cabinets, and fittings, with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, or ceiling trapeze. C-clamps or beam clamps shall have strap or rod-type retainers. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structures, but no load shall be applied to joist bridging. Fastenings shall be by expansion bolts on concrete; by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine screws. Raceways or pipe straps shall not be welded to steel structures. Holes cut to a depth of more than 1-1/2 inches in reinforced concrete beams or to a depth of more than 3/4-inch in concrete joists shall avoid cutting the main reinforcing bars. Holes not used shall be filled. Conduit shall not be supported using wire or nylon ties. Raceways shall be installed as a complete system and be independently supported from the structure. Upper raceways shall not be the support of lower raceways. Conduits shall be fastened to all sheet-metal boxes and cabinets with two locknuts where required by the NFPA 70, where insulating bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. Bushings shall be installed on the ends of all conduits and shall be of the insulating type where required by the NFPA 70. A pull wire shall be inserted in each empty raceway in which wiring is to be installed by others if the raceway is more than 50 feet in length and contains more than the equivalent of two 90-degree bends, or where the raceway is more than 150 feet in length. The pull wire shall be of No. 14 AWG zinc-coated steel, or of plastic having not less than 200-

pound tensile strength. Not less than 10 inches of slack shall be left at each end of the pull wire.

3.2.3 Sizes

Sizes shall be not less than indicated. Branch-circuit conductors shall be not smaller than No. 12 AWG. Conductors for branch circuits of 120 volts more than 100 feet long and of 277 volts more than 230 feet long, from panel to load center, shall be No. 10 AWG.

Higher temperature rated conductors shall be permitted to be used, if the size of the conductors is determined on the basis of the 60 degree C ampacity or 75 degree C ampacity within the range of wire sizes for which the terminals are marked and temperature ratings for which the equipment in the circuit is marked.

Conductor sizes for nonlinear loads shall be based on the use of minimum 75 degrees C insulated conductors for branch circuits and feeders.

3.2.3.1 Power Conductor Identification

All phase conductors shall be identified by color-coding. The color of the insulation on the phase conductors of different voltage systems shall be as follows:

120/240 volt, single/phase: red and black.

Conductor phase and voltage identification shall be made by color-coded insulation for all conductors smaller than No. 6 AWG. For conductors No. 6 AWG and larger, identification shall be made by color-coded insulation, or conductors with black insulation may be furnished and identified by the use of bands of colored electrical tape wrapped around the insulation 3 inches apart for the entire length within the indicated enclosure. Conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Phase identification by a particular color shall be maintained continuously for the length of a circuit, including junctions.

3.3 BOXES AND SUPPORTS

Boxes shall be provided in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways, 4-inch by 4-inch nominal size and smaller, shall be of the cast-metal hub type when located in normally wet locations, when flush and surface mounted on outside of exterior surfaces, or when located in hazardous areas. Boxes in other locations shall be sheet steel when permitted by NFPA 70. Boxes for mounting lighting fixtures shall be not less than 4-inches square except smaller boxes may be installed as required by fixture configuration, as approved. Indicated elevations are approximate except where minimum mounting heights for hazardous areas are required by NFPA 70. Unless otherwise indicated, boxes for wall switches shall be mounted 48 inches above finished floors. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Separate boxes shall be provided for flush or recessed fixtures when required by the fixture terminal operating temperature, and fixtures shall be readily removable for access to the boxes

unless ceiling access panels are provided. Boxes and supports shall be fastened with bolts and metal expansion shields on concrete and with machine screws or welded studs on steel work. Threaded studs driven in by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of expansion shields, or machine screws. In open overhead spaces, cast-metal boxes threaded to raceways need not be separately supported except where used for fixture support; cast-metal boxes having threadless connectors and sheet metal boxes shall be supported directly from the building structure. Cast-metal boxes with 3/32-inch wall thickness are acceptable. Penetration of more than 1-1/2 inches into reinforced-concrete beams or more than 3/4-inch into reinforced-concrete joists shall avoid cutting any main reinforcing steel.

3.3.1 Boxes for Use with Raceway Systems

Boxes for use with raceway systems shall be not less than 1-1/2 inches deep except where shallower boxes required by structural conditions are approved. Sheetmetal boxes for other than lighting fixtures shall be not less than 4 inches square except that 4- by 2-inch boxes may be used where only one raceway enters the outlet. Minimum size boxes for telephone outlets shall be not smaller than 4-1/2 inches square and 3-1/2 inches deep.

3.3.2 Boxes for Use with Cable Systems

Boxes for use with cable systems shall be not less than 3- by 2-inch sectional boxes, 2-inches deep.

3.3.3 Pull Boxes

Pull boxes of not less than the minimum size required by the NFPA 70 shall be constructed of aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified above. Boxes shall be furnished with screw-fastened covers. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number, and panel designation.

3.4 DEVICE PLATES

One-piece type device plates shall be provided for all outlets and fittings. Plates on unfinished walls and on fittings shall be of cast-metal having rounded or beveled edges. Screws shall be of metal with countersunk heads, in a color to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with cast-metal box. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed and provided with a hinged, gasketed cover, unless otherwise specified. Device plates for telephone and intercommunication outlets shall have a 3/8-inch bushed opening in center.

3.5 RECEPTACLES

3.5.1 Duplex

Duplex ground fault receptacles shall be rated 20 amperes, 125 volts, two-pole, three-wire, grounding type with polarized parallel slots. Bodies shall be brown. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side- or back-wired with two screws per terminal. Ground fault circuit interrupters shall have the current rating as indicated, and shall be the UL Class A type unless otherwise shown.

3.5.2 Weatherproof

Weatherproof receptacles shown shall be mounted in a box with a gasketed, weatherproof, cast-metal cover plate and gasketed cap over each receptacle opening. The cap [shall be permanently attached to the cover plate by a short length of bead chain.] [shall be provided with a spring-hinged flap.]

3.6 WALL SWITCHES

Wall switches shall be of the totally enclosed tumbler type. The wall switch handle and switch plate color shall harmonize with the color of the respective wall. Wiring terminals shall be of the screw type or of the solderless pressure type having suitable conductor-release arrangement. Not more than one switch shall be installed in a single-gang position. Switches shall be rated 20-ampere 120/277-volt for use on alternating current only. Pilot lights indicated shall consist of yoke-mounted candelabra-base sockets rated at 75 watts, 125 volts, and fitted with glass or plastic jewels. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches shall be red.

3.7 SERVICE EQUIPMENT

Service-disconnecting means shall be of the enclosed molded-case circuit breaker type as indicated with external handle for manual operation. When service disconnecting means is a part of an assembly, the assembly shall be listed as suitable for service entrance equipment. Enclosures shall be sheet metal with hinged cover for surface mounting unless otherwise indicated.

3.8 PANELBOARDS AND LOADCENTERS

3.8.1 Panelboards

Panelboards shall be circuit breaker equipped for lighting and appliance branch circuit.

3.9 UNDERGROUND-SERVICE CONDUITS

Empty conduits for underground electric-service cable shall be installed as indicated. Except where otherwise indicated, conduits shall terminate approximately 5 feet beyond the building wall and 2 feet below finished grade, with the outside ends bushed and plugged or capped.

3.10 LAMPS AND LIGHTING FIXTURES

Fixtures may be provided with No. 18 AWG stranded copper conductors in 3/8-inch flexible metal conduits not over 6 feet long where flexible metal conduits are permitted by NFPA 70. Ballasted fixtures shall have ballasts which are compatible with the specific type and rating of lamps indicated and shall comply with the applicable provisions of the publications referenced.

3.10.1 Lamps

Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.

3.10.1.1 Incandescent

Incandescent lamps shall be for 125-volt operation unless otherwise indicated.

3.10.1.2 High-Intensity-Discharge

High-intensity-discharge lamps shall be the high-pressure-sodium type unless otherwise indicated, shown, or approved.

3.10.2 Fixtures

Fixtures shall be as shown and shall conform to the following specifications and shall be as detailed on standard Drawing No. 40-06-04, Sheet Nos. 73, which accompany and form a part of this specification for the types indicated. Illustrations shown on these sheets are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar designs and equivalent energy efficiency, light-distribution and brightness characteristics, and of equal finish and quality will be acceptable if approved. In suspended acoustical ceilings with fluorescent fixtures, the fluorescent emergency light fixtures shall be furnished with self-contained battery packs.

3.10.2.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation.

3.10.2.2 Ceiling Fixtures

Installation and support of fixtures shall be in accordance with the NFPA 70 and manufacturer's recommendations. Where seismic requirements are specified herein, fixtures shall be supported as shown. Surface-mounted fixtures shall be suitable for fastening to the structural ceiling.

3.11 EQUIPMENT CONNECTIONS

All wiring not furnished and installed under other sections of the specifications for the connection of electrical equipment as indicated on the drawings shall be furnished and installed under this section of the specifications. Connections shall comply with the applicable requirements of paragraph WIRING METHODS.

3.12 PAINTING AND FINISHING

Field-applied paint on exposed surfaces shall be provided under Section 09900 PAINTING, GENERAL.

3.13 TESTS

After the interior-wiring-system installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the Contracting Officer. The Contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power. No part of the electrical distribution system shall be energized prior to the resistance testing of that systems ground rods and submission of test results to the Contracting Officer. Test reports shall indicate the location of the rod and the resistance and the soil conditions at the time the test was performed.